Claims

1. A carbonylation process for the production of a carbonylation product by contacting carbon monoxide with a feed comprising an alcohol and/or a reactive derivative thereof in the vapour phase using an heterogeneous heteropolyacid catalyst comprising one or more metal cations selected from Cu, Fe, Ru, Os, Co, Rh, Ir, Ni, Pd and Pt, characterised in that there is also present in the feed at least 0.5wt% water.

2. A process according to claim 1 wherein the feed comprises 1 wt%, such as at least 2 wt%, preferably at least 5wt% water.

3. A process according to claim 1 or claim 2 wherein the feed comprises up to 20 wt%, such as up to 15wt% water.

4. A process according to any one of the preceding claims wherein the feed comprises 5 to 15wt% water.

5. A process according to any one of the preceding claims wherein the water in the feed is fresh and/or recycle water.

6. A process according to any one of the preceding claims wherein the heteropolyacid comprises 1 to 6 wt% metal cation(s).

7. A process according to any one of the preceding claims wherein the heteropolyacid catalyst comprises a metal cation selected from rhodium, iridium and copper.

8. A process according to claim 7 wherein the metal cation is rhodium.

9. A process according to any one of the preceding claims wherein the heteropolyacid comprises a peripheral atom selected from the group consisting of molybdenum, tungsten, vanadium, niobium, chromium and tantalum and a central atom selected from silicon and phosphorus.

10. A process according to any one of the preceding claims wherein the heteropolyacid is selected from the group consisting of substituted silicotungstic acids, silicomolybdic acids, phosphotungstic acids and phosphomolybdic acids.

11. A process according to any one of the preceding claims wherein the heteropolyacid comprises one or more further cations selected from residual hydrogen ions and alkali metal cations.

12. A process according to any one of the preceding claims wherein the heteropolyacid catalyst is supported on a support.

13. A process according to claim 12 wherein the support is selected from an oxide support and a non-oxide support.

14. A process according to claim 13 wherein the oxide support is selected from the group consisting of silica, alumina, silica-aluminas, zeolites, clays, diatomaceous earths and titania.

15. A process according to claim 13 wherein the non-oxide support is selected from the group consisting of silicon carbide, carbons and organic polymers.

16. A process according to any one of claims 12 to 15 wherein the heteropolyacid comprises 20 to 70 % by weight based on the total weight of heteropolyacid and support.

17. A process according to any one of the preceding claims wherein the alcohol is a C_1 to C_{12} aliphatic alcohol.

18. A process according to claim 17 wherein the alcohol is selected from methanol, ethanol, propanol, isopropanol, the butanols, the pentanols and the hexanols.

19. A process according to any one of the preceding claims wherein the reactive derivative of the alcohol is selected from at least one of a dialkyl ether, an ester of the alcohol and an alkyl halide.

20. A process according to claim 19 wherein the reactive derivative is selected from at least one of methyl acetate, dimethyl ether and methyl iodide.

21. A process according to any one of the preceding claims wherein the feed comprises an alcohol and a reactive derivative thereof.

22. A process according to claim 21 wherein the reactive derivative is an ether or an ester of the alcohol.

23. A process according to claim 22 wherein the ether and/or the ester is present in an amount up to equimolar to the amount of water in the feed.

24. A process according to any one of the preceding claims wherein the carbonylation product is selected from at least one of a carboxylic and a carboxylic acid ester.

25. A process according to claim 24 wherein the carbonylation product is selected from at least one of acetic acid and methyl acetate.

26. A process according to any one of the preceding claims wherein the carbon monoxide to alcohol molar ratio is in the range 5: 1 to 15 : 1.

27. A process according to any one of the preceding claims wherein the feed also comprises hydrogen.

28. A process according to claim 27 wherein the hydrogen to carbon monoxide molar ratio is in the range 1 : 20 to 20 : 1.

29. A process according to any one of the preceding claims wherein the carbon monoxide is used in the form of synthesis gas.

30. A process according to any one of the preceding claims wherein the process is carried out at a temperature in the range 100 to 300 °C.

31. A process according to any one of the preceding claims wherein the process is carried out at a pressure in the range 1 to 100 barg.

32. A process according to any one of the preceding claims wherein the gas hourly space velocity is in the range 100 to 10000 h^{-1}.

33. A process according to any one of the preceding claims wherein the process is carried out as a continuous process.